Student engagement in online delivery of mathematics and statistics modules

- a personal account -

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My maths and stats teaching before March 2020

Pre-COVID teaching reflects typical mathematics/statistics lecturer: blackboard based classroom teaching. Passive learning?

Use of technology before March 2020:

- VLE for announcements, weekly notes and problem sheets, discussion boards.
- Lecture slides (depending on nature of module).
- Use of mathematical and statistical software (Excel, R, Python, MATLAB, Mathematica, SageMath).

Main engagement through synchronous faculty-student and student-student communication and collaboration.

Should we aim for similar engagement when teaching online?

Are tablets a good online alternative to blackboards?

Advanced mathematics and statistics concepts difficult to teach via slides. Blackboards slow us down, prompt mistakes and student interaction.

My experience:

- XP-Pen and MS Whiteboard for webinars and feedback.
- *Advantages:* Good for formulae, derivations and drawings. Slows you down. Can export and share with students. Can be used anywhere.
- *Disadvantages:* Requires some practice. May have to flip between applications regularly.

For how long do students "engage" in a typical webinar?

Module	Statistics (slides)	DEs (tablet)
Avg proportion	71%	89%

Suggesting a (significant?) difference in favour of tablets.

This is supported by student feedback as well.

Quizzes: do students participate & do they work?

Quizzes can be good way to engage students in asynchronous activities.

My experience:

- Predominantly implemented using BB's test tools though alternatives such as NUMBAS and STACK exist.
- *Advantages:* Facilitate student engagement in asynchronous activities. Easy to reuse. Good for large cohorts. Useful to identify response patterns (particularly relevant in "flipped" approach).
- *Disadvantages:* Focus on low level learning objectives. Can only check factual knowledge (not problem solving skills etc). Limited feedback. Time consuming to construct.

Are quizzes equally useful for all (asynchronous) phases?

- Investigate quizzes (stats): 62%.
- Consolidate quizzes (discrete maths): 41% with weak (but significant) positive correlation between quiz scores and final test score.

Videos & recordings: do these reduce engagement?

Videos/recordings can be good supplement to webinars but play *precarious* role in context of student engagement.

My experience:

- Mainly short introductory videos, using Panopto, and recording of Collaborate sessions.
- *Advantages:* Flexibility for students. Students can (re)watch complicated derivations at own pace. Good for revision.
- *Disadvantages:* Risk of reduced attendance and student focus during webinars. May affect faculty-student interaction. Videos time consuming to produce and can get too "polished".

Panopto produced videos in stats module on average viewed by 14% of students (compare with 62% quiz participation in same module, cf. p.4).

No data for Collaborate recordings, but student feedback suggests these have been (too?) popular.

Face-to-face return: FLEXibility with care

With care, above tools could be used in face-to-face (or hybrid) setting both to facilitate student engagement *and* add flexibility.

- *Tablets* are here to stay as can (almost fully) replace blackboards. Could enhance use to let students participate as well.
- *Quizzes* good tool for prompting asynchronous engagement related to simpler concepts (particularly in flipped setting).
- Aim to continue delivering sessions via Collaborate but plan *recordings* carefully and monitor use.

Good use of technology can increase student engagement, particularly by allowing for more focused faculty-student interactions.

Any questions?

Selected references

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